To: Loxahatchee River Coalition/Jupiter Farms Environmental Council
info@loxrivercoalition.org

From: Planning and Development Division, Water Supply Department, South Florida Water Management District (SFWMD)

Date January 7, 2003

Subject: SFWMD Staff responses to the draft comments, dated September 12, 2002, that were received from the Loxahatchee River Coalition concerning public response to the recommended Minimum Flow & Levels for the Loxahatchee River & Estuary.

Thank you for your extensive and detailed comments on the SFWMD July 2002 publication entitled**,** ***"****DRAFT Technical Documentation to Support Development of Minimum Flows and Levels for the Loxahatchee River and Estuary*". We appreciate the time and effort taken by the Loxahatchee River Coalition to carefully review this document and provide thoughtful and constructive comments.

We were especially pleased to see that many of the issues you mention were similar to concerns raised by other agencies, concerned citizens and the peer review panel. In many cases, the changes that you have suggested in your comments have been addressed in the revised and updated November 2002 version of the document and appendices. We have included new or additional information, analyzed additional data, and provided new or updated interpretation and discussion, based on your suggestions. The final product has been greatly improved by the valuable insights, suggestions and information provided by the Loxahatchee River Coalition.

We have identified a few of the questions or concerns raised by The Loxahatchee River Coalition that we feel warrant further discussion and clarification, as noted on the attached pages. Please also take the time to examine the updated documentation we have placed on the SFWMD website at *www.sfwmd.gov./org/wsd/mf/loxmfl/docs.html* or contact Cathy McCarthy at 561-682-6325 if you would like to receive hard copies of these reports. If you have additional technical comments or concerns, please contact the project manager, John Zahina at 561-682-6824.

LOX RIVER COALITION COMMENT:

I. Current data is incomplete (part A)

The District's Staff has indicated that the current data sets they are using are incomplete and therefore they should take into consideration a seasonally fluctuating minimum flow based on prior comprehensive research.

In a meeting with the Loxahatchee River Environmental Control District [LRED] on August 7th, SFWMD staff indicated that District data on salinity and flows for the Loxahatchee River is incomplete. LRED offered to share the bi-monthly data that they have collected for over ten years. SFWMD staff asserted that they need to install salinity, flow and temperature probes at various points in the river and that after one year they will have enough data to extrapolate a more complete model. Based on District staff comment we conclude that the SFWMD's current dataset is insufficient to construct an MFL regime that will adequately protect the River.

DISTRICT STAFF'S RESPONSE:

The Minimum Flow and Level Statute (Ch 373.042(1)(b) F.S.) instructs water management districts ". . . using the best information available." All available salinity data from the Loxahatchee River were compiled and considered in developing the proposed MFL. This included the list of studies presented in Appendix A, the technical analyses presented in Appendices D, E, F and P of this report, as well as water quality data available from various agencies. Salinity data from the Loxahatchee River Environmental Control District (LRECD) were used to calibrate and verify the hydrodynamic salinity model for the Loxahatchee River (Appendix E).

Salinity data from the LRECD for upstream areas of the NW Fork can be divided into two types. The bi-monthly data (1991 to present) was collected for two water depths. Unfortunately this salinity data does not capture the daily changes that can occur over short time intervals (minutes to hours) due to tidal influences. In reality, salinity concentrations vary considerably from hour to hour at different sites each day as the tidal surge moves upstream and recedes from the river channel. A single sampling event is only able to determine salinity at a specific location at that moment, but cannot tell us what the minimum, maximum, and daily average salinity is for that site. Only a continuous sampling event, such as one where water samples are collected at multiple depths at regular intervals (such as once an hour) can provide that kind of information. Because of the expense and manpower requirements of this type of sampling, it is typically only conducted sporadically during low flow conditions. The second type of data collected by LRECD is this kind of continuous sampling event. Since the hydrodynamic salinity model calculates salinity along the Loxahatchee River for each half-hour time step, it was the continuous salinity data that were used to compare how well the model predicts measured salinity. The results from that analysis are in presented in Appendix E. Based upon a comparison of what the model predicts and what was actually measured at various sites along the NW Fork, we concluded that the model is the best available tool that can provide reasonable predictions of salinity conditions on the river.

When we indicated that current salinity data sets are incomplete, we mean that there was no continuously-sampled salinity data set for the NW Fork that covered the desired long period of time (e.g. 30 years) at specific locations where plant communities have been studied along the

river. This information is necessary in order to associate a salinity exposure with damage to freshwater plant communities. However, shorter-term, continuously-sampled data were available from LRECD for the period from 1995 to 2001 and were used to calibrate the hydrodynamic salinity model. Comparison of these data with results of model simulations, indicated that the model produces a reasonable estimate of long-term salinity conditions on the river. The model was then used to estimate a long-term (30 year) salinity time series at each of the eight vegetation sampling sites.

This method of using a model to estimate past conditions has been used elsewhere. For example, the St. Johns River Water Management District used a model to estimate a historical lake level time series using long-term rainfall and aquifer level data. Using the output from this model, "historical" levels in Lake Washington were estimated and used as a basis for developing an MFL. Models have also been used to estimate past or future conditions in the development of all regional water supply plans completed by the SFWMD and to develop simulations for the Comprehensive Everglades Restoration Plan (CERP) and are widely accepted as valuable tools in investigating water resource needs. This approach is also discussed in the USGS report entitled, "Instream Flow Incremental Methodology," which relies heavily on the use of models to "backcast" historical hydrologic conditions when no data are available. More information can be obtained from the USGS web site (www.mesc.usgs.gov/products/softare/ifim/)

Additionally, as part of the MFL recovery plan, flow, salinity, and temperature sampling is planned for the Northwest Fork and its three major tributary streams. This information is needed to develop and verify a 3-dimentional hydrodynamic model for the Loxahatchee River now in development. That study will be able to directly relate different flows from tributary sources with varying salinity concentrations both vertically in the water column and spatially along the river. This "next generation" of salinity model for the river will greatly improve our ability to simulate different management scenarios and will be the basis for future revisions to the MFL.

LOX RIVER COALITION COMMENT:

I. Current data is incomplete (part B)

While the District develops a more complete model, we suggest the District investigate use of the LRED's research, especially as interpreted in "Freshwater Flow Requirements and Management Goals for the Northwest Fork of the Loxahatchee River" (Dent & Ridler, 1997). This study recommends a minimum flow of 75 cfs for the height of the dry season (April-May) and suggests a seasonally fluctuating minimum flow up to 130 cfs throughout the wet season (July-November).

DISTRICT STAFF'S RESPONSE:

A review of all flow-salinity studies that have been conducted on the NW Fork of the Loxahatchee River (see Appendix A) reveals that the numerous authors have taken the position of determining a Lainhart (or Lainhart plus other tributaries) flow in order to manage the river for control of salinity concentrations. It is important to note that these studies (1) consider only salinity management in protection of the freshwater floodplain swamp; (2) vary widely in their recommendations for a minimum flow; and (3) vary widely in their opinions of where the

transition between saltwater and freshwater conditions should occur. Although these studies have produced valuable information concerning the relationship between river flow and salinity, and presumably recommended a minimum flow to prevent *harm*, none were developed based on the specific statutory MFL requirements of Chapter 373.042 (1) F.S. that require assessment of the effects of withdrawals and protection from *significant harm*.

LOX RIVER COALITION COMMENT:

II. Florida law requires the establishment not just of minimum flows, but also minimum levels.

Specifically, Florida Statutes §373.042 requires that water management districts develop minimum flows and levels for surface waters and aquifers. The District's documentation and recommendations would only address part 1a of this statute by recommending a minimum flow of 35cfs over Lainhart Dam. It does not, however, recommend an explicit minimum level as required by part 1b.

DISTRICT STAFF'S RESPONSE:

You are partly correct. Florida law (Chapter 373.042(1) F.S. requires each water management district to establish minimum flows and levels (MFLs) for surface waters and aquifers within their jurisdiction. The statute however goes on to state that "minimum flows" will be established for all surface watercourses in the area, and that a minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. The statute also defines the term "minimum water level" as the level of groundwater in an aquifer and the level of surface water at which withdrawals would be significantly harmful to the water resources of the area.

Nowhere in the statute does it specifically state that both definitions (minimum flow and minimum level) must be determined concurrently for each water body. The SFWMD has determined that the Northwest Fork of the Loxahatchee River is a natural surface watercourse, that the primary problem affecting the watercourse is the migration of saltwater upstream that has impacted the resource during dry periods, and that the most appropriate way to protect this resource is to provide a *minimum flow* that will reduce further upstream migration of salt water.

This is consistent with the approach used by the District to established minimum flow criteria for the Caloosahatchee and St. Lucie estuaries. In contrast, the District has established *minimum levels* for the Biscayne aquifer, Lower West Coast aquifers, Lake Okeechobee, and Everglades surface waters.

LOX RIVER COALITION COMMENT:

III Minimum levels are required to prevent further harm and degradation to the River

Although the Lainhart and Masten dams could arguably enforce their own specific minimum levels upstream (the height of the dams), a minimum level needs to be set for that segment of the River that lies downstream of the Masten dam. If the District is determined to prevent further saltwater incursion, it cannot do so without setting a minimum level or otherwise ensuring that

minimum flows over Lainhart are increased in proportion to unexpected changes in flows from groundwater and tributaries.

Since District staff has conceded that knowledge of the hydrodynamics and ecology of the Loxahatchee River and Estuary is incomplete, it is therefore conceivable that supplying a minimum flow of 35cfs over Lainhart Dam may not be sufficient to keep the salinity at river mile 9.2 from exceeding 2 ppt. To safeguard against potential flaws in the District's minimum flow modeling, an explicit minimum level needs to be set for river mile 9.2 in conjunction with the 35cfs minimum flow over Lainhart Dam.

DISTRICT STAFF'S RESPONSE:

At the request of reviewers, a study of the water levels in the floodplain swamp along the NW Fork was conducted. Surveyed transects across the floodplain of the NW Fork were used to determine the elevation (NGVD) of the floodplain between the opposing upland embankments at 10 ft increments. These surveys were conducted in December 1983, before the designation of the NW Fork as "Wild & Scenic" and before the surrounding lands were purchased by the District for preservation. Stage recorders were installed at four transect locations to measure water levels from September 1984 through June 1990. Continuous stage data are available at Lainhart Dam from April 1971 to present. The locations of these transects, which lie between Lainhart Dam and Trapper Nelson's site, represent the most pristine river floodplain swamp.

The results of this floodplain water level study provided more insight into the hydrological needs of the remaining floodplain swamp. Correlations were established between flow over Lainhart Dam and water levels at these transects. These estimates of water levels at each transect were then used to calculate the percentage of flooding in the floodplain. These results indicate that more than 50% of the floodplain swamp is inundated at a flow of 35 cfs. At flows of 65 cfs, 65% to 75% of the floodplain is inundated. These results are compiled in Appendix N of the November 2002 version of the Final Draft Technical Document. Studies that have been conducted in floodplain forests throughout the world have shown that the soils in such forests must be allowed to dry out occasionally, for sufficiently long periods to allow seed germination and growth. Failure to provide such conditions will eventually lead to damage and loss of the floodplain swamp. Clearly, setting a minimum flow or level where the floodplain is rarely allowed to dry out will destroy the floodplain forest. The current Consent Agreement, which requires the District to provide 50 cfs when upstream water is available, and the proposed minimum flow criteria, which allow a very short (20 day duration) period below 35 cfs every six years, represent a balance among competing management objectives. These flow regimes are designed to limit saltwater intrusion, provide sufficient inundation for the floodplain swamp to protect aquatic organisms and still permit occasional drying of floodplain soils.

LOX RIVER COALITION COMMENT:

IV. Recommended minimum flow requires more controls

For the current recommendation of 35cfs over the Lainhart Dam to work effectively, more controls are needed.

Due to the lack of data for groundwater and stream flow from tributaries, the model calibration was based on the historic flow recorded at Lainhart Dam to estimate the total freshwater input to the river system. In the model, discharges from tributaries were calculated as a constant fraction of the discharge at Lainhart Dam (i.e. total surface freshwater input in the model was linked to Lainhart Dam flow via flow ratios. Flow factors of 0.65 for Cypress Creek, 0.14 for Hobe Grove, 0.08 for Kitching Creek, 1.4 for Trappers and 1.16 for LOXTnpk were established. For example, if the flow at Lainhart Dam was in fact 100 cfs, the model would recognize the flow for Cypress Creek at 65 cfs, 14 cfs for Hobe Grove, 8 cfs for Kitching Creek, 140 cfs for Trappers, and 116 cfs for LOXTnpk.

Another assumption used in the model was a constant input from ground water of 40 cfs. Cypress Creek, Hobe Grove, Kitching Creek and the NW fork at Trappers each received 10 cfs of groundwater input for a total ground water input of 40 cfs.

These model assumptions have important ramifications:

1. *The total inflow to the NW fork associated with a flow of 35 cfs at Lainhart Dam is considerably larger and includes discharges from groundwater and tributaries. Under the 35 cfs at Lainhart Dam Scenario, tributary flows would be modeled as follows: Cypress Creek 33 cfs, Hobe Grove 15 cfs, Kitching Creek 13 cfs, Trappers 59 cfs, & LOXTnpk 40 cfs (flows include groundwater contributions of 10 cfs).*

2. *The flows for the tributaries were assumed to be proportional to the flows from Lainhart Dam and hence may not accurately represent actual flows, especially with depressed water tables.*

3. *Groundwater levels that produce the assumed groundwater input may not be present when needed most.*

The following controls would mitigate potential problems under the current proposal:

1. *The establishment of a minimum level for groundwater so that the groundwater level that produces 40cfs in the model is adequately protected.*

2. *The establishment of minimum flows for the tributaries in order that their modeled flows corresponding to the Lainhart Dam minimum flow of 35 cfs are protected.*

3. *When tributary surface water flows fall below their corresponding modeled flows for 35cfs at the Lainhart Dam, then the Lainhart Dam flows are to be increased by the difference.*

4. *When groundwater levels fall below the level needed to produce the modeled 40cfs contribution, then Lainhart Dam flows are to be increased to be commensurate with the groundwater loss.*

DISTRICT STAFF'S RESPONSE:

Your observations about the assumptions used in the modeling and their operational and management implications are valid concerns that will ultimately determine how effectively this system can be managed and protected. Your suggestions for how to manage this system generally reflect the kind of approach and operational protocols that may be used once facilities are in place to deliver supplemental water to the basin. Under current conditions, however, the SFWMD has very limited capability to effectively manage flows to the river during dry periods.

There is evidence to substantiate the assumptions that the flow ratios used in this report are representative of tributary flows during dry periods. Actual tributary flow data collected during drought periods were analyzed and the ratios were very close to those used in the model. A further discussion of this issue is provided in the revised report and all of the data used for this analysis are provided in Appendix D of the November 2002 version of the Final Draft Technical Document.

Nevertheless, even though the numbers seem to reflect long-term or average relationships among the various sources of freshwater inflow, the various figures provided in Appendix D indicate that a great deal of variation occurred among salinities predicted by the model based on Lainhart Dam flows alone. This suggests that variability in other tributary flows, groundwater and perhaps effects of wind, storm surges or other factors also influence salinity along the river.

The District is presently installing additional tributary flow and monitoring facilities within the river and watershed. Continuous salinity monitoring will also occur at the points where the major tributaries join the Northwest Fork. A complementary groundwater monitoring network should also be considered, perhaps as part of the restoration effort. Data from these sources could be used to verify and refine our assumptions concerning how much freshwater is actually entering the system.

A more direct means to determine the success of the proposed MFL criteria would be to monitor salinity conditions at or near river mile 9.2 and determine the ability of the freshwater flow regime to actually prevent saltwater intrusion. This approach has now been added to the MFL Rule and will provide a means to integrate flow from all sources and, most importantly, indicate whether the amount of flow provided was actually protecting the resource. An approach of this type was used in the Caloosahatchee River and Estuary MFL, which provides criteria for river flow at the Franklin Lock and Dam and criteria for salinity exceedance at the point in the river where the resource (a bed of submerged freshwater plants) needs to be protected.

Most importantly, a comprehensive ecosystem monitoring effort is needed that examines not only the six key VEC species, which show long-term trends in the forest community, but also the 35-40 other herbaceous species and other appropriate features that can indicate stress or damage on shorter time scales.

The other critical component is to determine what actions can be taken if (when) a MFL exceedance occurs or is likely to occur. Until facilities are in place to provide more water to the river, such exceedances are likely to happen and the District is very limited in the actions that can be taken in response to such exceedances. Once new facilities have been constructed and additional water is available, the operational protocols associated with these facilities must be developed that will describe what actions taken to address MFL exceedances.

The South Florida Water Management District submitted a letter to the Florida Department of Environmental Protection on October 31, 2002, adding Cypress Creek, Hobe Grove Ditch, and Kitching Creek, the primary tributaries to the Northwest Fork, to the Minimum Flows and Levels 2003 Priority List and Schedule. The recent efforts to develop MFLs for the NW Fork of the Loxahatchee River indicated the need to better define, and establish MFL criteria for other tributary inflows to this river that had very little available flow data. The District has committed to developing MFLs for these water bodies by 2007, which will allow the staff sufficient time to collect and analyze flow data from the gauges that will be installed within the tributaries this year. The proposed MFL rule reiterates the intent to develop MFLs for these tributaries and also for the Loxahatchee Slough.

In addition, portions of Cypress Creek, Kitching Creek and Hobe Grove Ditch, which extend westward from river mile 10.6 to the intersection of Gulf Stream Citrus Road (latitude 26.96484, longitude 80.1855), from river mile 8.1 northward through JDSP to the north of Bridge Road (latitude 27.05513, longitude 80.17580) and from river mile 9.1 westward to the Hobe-St. Lucie Conservancy District pump station outfall (latitude 26.5908, longitude 80.1031) respectively, were included in the description of the Northwest Fork MFL water body.

Under our current management practices, flows to the river are largely driven by local rainfall events. When rain falls in the watershed, the excess runoff flows to the canals and rivers and is discharged to tide. This results in flow rates that vary widely from as little as 50 cfs up to 1,200 cfs or more during extreme storm events. When there is no local rainfall, seepage of groundwater out of the sloughs and into the canals and tributaries, provides a base flow of surface water that feeds into the river. As the dry season progresses and groundwater levels decline further, water levels in the rivers and canals also decline until they may reach a point that water no longer flows across the structures. During such periods, river flow is probably controlled by groundwater seepage -- around the control structures and into the river channel.

The SFWMD controls discharge into the Northwest Fork of the River through the G-92 structure. Operational guidelines for these facilities are described in Appendix L of the November 2002 version of the Final Draft Technical Document. When there is little or no rainfall occurring in the Loxahatchee River basin, but water levels upstream of the structure are high enough (12.5 feet or above) to allow water to pass, a flow of 50 cfs is provided through this structure to the river. As water levels approach 12.5 feet, discharge rates are reduced so as to be able to prolong the period of discharge. If water levels are not high enough upstream to provide a flow of 50 cfs, then whatever amount of water is available, is allowed to pass through the structure. Once upstream water levels are below 12.0 feet, the G-92 structure is closed no water can pass. All flow in the Northwest Fork is then provided by local rainfall, runoff and seepage occurring further downstream.

Water flows from G-92 downstream through the C-14 Canal, past the drainage outlet from Jupiter Farms to the Lainhart Dam. This means that flow across Lainhart Dam is the total amount of flow from G-92 plus the amount of water discharged from Jupiter Farms plus a small amount of groundwater seepage that occurs in that portion of the canal.

By the time that flow at Lainhart Dam drops below 35 cfs, there is only a very small amount of water available in Loxahatchee Slough. Even if it were possible to force more water through the G-92 structure (for example with a pump), the result would be that the slough would empty

faster. A short-term gain in flow rate would thus result in a longer period with reduced or no flow occurring to the river. The only way to correct this deficiency is to provide more storage.

LOX RIVER COALITION COMMENT:

V. Florida law requires MFLs for the entire River.

Florida Statutes §373.042 provides explicitly that the water management districts shall establish minimum flows "for all surface watercourses." It was not the intent of the statute to require that the districts establish minimum flows only for federally recognized wilderness preserves. In fact, the law states that the districts shall establish minimum levels for groundwater, as well as, surface waters. Given the rate of development in the adjacent areas, we are concerned about the impact of further groundwater withdrawals not only on the river, but also on the surrounding protected areas (Jonathan Dickinson State Park, Riverbend Park, Cypress Creek Tract, and Pal Mar, etc.).

Although the Wild and Scenic portion of the NW Fork is an exceptional natural resource, the entire river is of significant ecologic, economic and aesthetic value to Palm Beach County and the State. The estuary is home to a thriving fishing and boating economy that contributes important revenue to the local economy. Riverfront property is among the most valuable in the area and homeowners have a vested interest in the health of the entire River. We do not agree with the District's reasons for setting only a minimum flow for a small segment of the NW Fork based on the lack of "infrastructure and facilities." The statute in question does not ask the District to "provide and manage" flows. It requires the District to determine minimum flows and levels beyond which further withdrawals would be "significantly harmful to the water resources or ecology" thus providing the districts with a limit at which to prevent further withdrawals.

DISTRICT STAFF RESPONSE:

The SFWMD has limited resources and staff to use for development of MFLs and there are many areas within the District that are severely threatened. That is the reason for the MFL Priority Waterbody List. The District has chosen to divide up areas in order to establish MFLs, based on available information, coordination with other activities, and the principle that protection of the most sensitive indicator of resource impacts will also provide protection for less-sensitive resources. Also, as identified in the MFL legislation Section 373.042(2) F.S., priorities are established based on ". . . existence of potential for significant harm . . ." and ". . . those waters that are experiencing or may be reasonably expected to experience adverse impacts."

Examples of this approach are seen in the MFL criteria that have been developed for other areas within the District as follows:

- For the Biscayne Aquifer, MFL water levels were established for the northern part of the aquifer in 2001 and water levels for the southern part will be identified in 2004 in conjunction the Biscayne Bay MFL.

- In the St. Lucie Estuary, MFL criteria were based on protection of the oligohaline zone in the estuary. There were no perceived threats to freshwater systems in the rivers themselves

that would not be adequately protected by providing the amount of water needed to protect the estuary.

- In the Caloosahatchee River and Estuary, providing the flow needed to protect the freshwater plant community located downstream of the locks and dam would also protect resources in the river itself and downstream estuarine communities.

District staff recognize that the proposed criteria for the Northwest Fork of the Loxahatchee River do not provide adequate protection for the tributary basins and therefore have added these tributaries to the 2003 MFL priority list.

Ultimate resource protection of the Loxahatchee River and estuary lies not just with establishment of the MFL and recovery plan, but also with the establishment of a water reservation in conjunction with the definition of practical restoration goals and an associated restoration plan. The MFL criteria will then need to be revised to be consistent with the restoration plan and reservation.

LOX RIVER COALITION COMMENT:

VI. Sampling conducted to date is insufficient

In the June 10th draft of their FAQ about MFLs for the Loxahatchee River, the District staff cites that peer review observed that cypress trees were "not particularly good indicators of salinity stress." In response staff selected a number of Valued Ecosystem Component [VEC] species. Although the District staff appears to have done a good job at assessing the health of the selected species, the selection of only large, woody plants provides only a very narrow cross-section of the River's diverse population and is not a true indicator of overall river vegetation.

In our opinion the VECs of the river must necessarily include aquatic life such as herbaceous aquatic plants, fish, amphibians, and other species that are more sensitive to saltwater intrusion than just the few selected species.

DISTRICT STAFF'S RESPONSE:

District staff recognizes that the selected VEC "key" species represents the selection of only large, woody plants and that these are only a very narrow cross-section of the River's diverse population. District staff feels that the VEC "key" species considered (9 in all, see Table C-2), as well as other aspects of the community (e.g. total number of species, measurement of growth parameters, and canopy structure) are true and reliable indicators of overall freshwater floodplain vegetation health.

An important consideration of this analysis is that the primary VEC in the Loxahatchee River MFL is not a **species**, but the entire **vegetation community structure**. A discussion of the ecological importance of maintaining the freshwater floodplain swamp can be found on pages C-19 to C-20 (also see pages 107-110). This VEC is holistic in scope, as outlined in the definitions of "No Harm," "Stressed," and "Significant Harm" provided on pp. 146-147. This VEC was developed based on consideration of the following:

(1) Identification of the dominant species in the freshwater floodplain swamp (both in terms of physical size and biomass), which are listed in Table C-2 on page C-9. Five of these species are strictly freshwater in distribution;

(2) The total number of other plant species present (see Figures C-3a and C-3b, page C-11);

(3) Growth measurements of the dominant species (see Table 31, page 116);

(4) A decline in floodplain forest canopy structure (see Figures C-4a, C-4b and C-4c, page C-14); and

(5) The presence of seedlings/saplings (Table 32, page 116), which indicate the ability of the community to reproduce itself.

District staff considered other potential VECs, including herbaceous aquatic plants, fish, amphibians and other species that are potentially more sensitive to saltwater intrusion. Many of these species, although they may be rapidly affected by saltwater intrusion, will also recover very rapidly once salt water is removed, and hence cannot be used effectively as a basis to define significant harm that takes two or more years for recovery to occur.

Also, herbaceous plants tend to have shallower root systems and hence may not respond to the effects of saltwater intrusion to the same extent as the larger trees. Because seawater is denser than fresh water, saltwater intrusion generally occurs first at the base of the aquifer, resulting in contamination of deeper waters before the shallow zones of the aquifer and surface waters are affected. In addition, herbaceous species may also respond rapidly to a number of other environmental variables such as the effects of drought, fire, frost or disease and therefore may not be the indicator of long-term salinity effects.

Because of the lack of scientific data that documents salinity tolerance in many plant species found along the Loxahatchee River, the semi-quantitative vegetation study was conducted in 2000-2001 to indicate the best potential indicator species. The result of this study was the selection of those species that were included in the VEC. Unfortunately there were no native and widespread herbaceous aquatic plants that occurred in the freshwater floodplain of the Northwest Fork, hence no particular species were proposed as indicators of salinity intrusion to that area. Fish, amphibians and birds are mobile and can move in response to changes in salinity conditions. Hence the location of these species today may not reflect what has occurred at the site during the last dry season (which may have damaged the plant community). To compound this problem further, standing freshwater may be found in backwater areas during periods when the river channel may have elevated salinity. Measurement of such mobile organisms (fish, amphibians, and birds) at particular river segments may thus confound direct correlation of community change to salinity. In addition, there were no long-term or comprehensive monitoring data for the distribution of these organisms within the Loxahatchee River system that that could be used a basis to determine the extent to which these organisms have been impacted by flow rates, water levels or salinity.

To address these issues, District staff will continue to investigate potential VECs that will be used to monitor brackish and saltwater portions of the Loxahatchee River system, including species suggested above and others (including algae and invertebrates). The MFL proposed in

this document focuses on protection of the remaining freshwater floodplain swamp community, which is the resource that the "Wild & Scenic River" was designated to protect. In order to continue to protect the "health" of the freshwater floodplain swamp, District staff feel that studies conducted to date confirm that the current VEC is appropriate to the resource, was developed based on the best information available.

LOX RIVER COALITION COMMENT:

VII. The report is overly reliant on aerial photography and contemporary data regarding the health of the River

In our opinion the District has relied too heavily on aerial photography in the assessment of the River's health and failed to obtain enough detailed hydrological & biological information (or "ground truth") necessary to properly support the broad assumptions based on the extant photographic record. Furthermore, the District has not satisfactorily addressed the possibility of harm that might have occurred between 1995 and 2002.

On page 123, the Draft states, "…19 additional acres [of freshwater vegetation] were lost from this community between 1985 and 1995." It does not indicate how many acres have been lost between 1995 and 2002. Throughout the Draft, the District presents 1995 (mainly photography) data as if it is up-to-date. If no aerial photography is available for 2000 or later then a thorough ground survey may be required in order to accurately determine the state of the River and watershed today.

In our opinion the District staff have not been provided with the resources required to accurately measure the River's current condition and how that condition has changed over time. While staff has surveyed the encroachment of mangroves into the cypress forest up until 1995 but we remain unconvinced that substantial damage has not occurred to the River since 1985. Furthermore, the justification for using the date of the River's Federal Wild and Scenic River (1985) as a benchmark (or base) for setting the MFLs, has not been substantiated. The state requirement for MFLs was created through the enactment of §373.042, Florida Statutes in 1972 and the designation of Jonathan Dickinson State Park occurred in late 1940's. If a date is needed for determining what stage of freshwater flow the MFLs should aspire to, then the District should use the designation of the State Park.

DISTRICT STAFF'S RESPONSE:

Aerial photographic surveys from 2000 are only now becoming available and, as such, were not used in the July 15th, 2002 draft document. Analysis is ongoing. However, extensive field surveys of the vegetation community along the NW Fork were conducted between 2000 and 2002. This information is the most current and detailed vegetation information available for the River. This included the recording of all species and their abundance found at each of 33 sites (23 on the NW Fork, 10 on Kitching Creek), measurement of the height, canopy diameter, trunk diameter, and seedling/saplings of dominant tree species. The results of these studies are found in Appendix C and summarized in Chapter 4 (pages 84-86) and Chapter 5 (pages 111-118). The data from these surveys were used to develop the vegetation map presented in Figure 31-C, page 131. This map shows the present location of "healthy," "damaged," and "mangrove-dominated"

segments of the NW Fork, and was based solely on the results of the in-depth vegetation surveys conducted from 2000-2002 (not from aerial photography). When comparing this map (2002 conditions) with that developed by the Florida Department of Natural Resources (now FDEP) for the Environmental Impact Statement for the Wild & Scenic River in 1984 (Figure 31-A, page 131) the extent of freshwater and mangrove communities seems to have changed little, if any. In fact, the transition zone between mangrove and freshwater communities may be further downstream today than is shown on the FDEP's 1984 map. Additionally, the aerial photo study presented in Appendix B, which compared photography from 1985 and 1995, was unable to document any significant change between the mangrove-freshwater swamp boundary between these years. Since these two independent studies (field study map from 2000-2002 compared with 1984 FDEP vegetation map, and 1985 aerial photography compared with 1995 aerial photography) give similar results, the conclusion was reached that no significant change in extent of mangrove-freshwater communities has occurred in the NW Fork since the mid 1980's.

LOX RIVER COALITION COMMENT:

VIII. Seasonal variability is an important consideration.

A static minimum flow does not take into account seasonal variability, which is essential for the preservation of the River's natural systems.

The District touches on seasonal variability in pp. 11,12 and 97, and on the erratic nature of that variability from year to year (often as the result of hurricanes, storms, El Niño, etc.) in Figure 4 on p. 12. It does not, however, significantly address how native biota are dependent on such variability as did the SJRWMD in setting MFLs for the Wekiva River System.

The SJRWMD, under the direction of Henry Dean in 1994, felt very strongly that setting one static minimum flow or level cannot sufficiently preserve either a lotic or lentic system as, over time, such a minimum often becomes the de facto average. The SJRWMD felt that lotic systems were best protected by a regime of multiple MFLs. It is for this reason that the MFL regime worked out for the Wekiva River, by SJRWMD is so exemplary. We can find no justification for setting an MFL that affords less protection to the Loxahatchee River.

DISTRICT STAFF'S RESPONSE:

The intent of the MFL is to define the "limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area" (Section 373.042(1)(a), F.S.). Section 373.042(1)(b) indicates that "When appropriate, minimum flows and levels may be calculated to reflect seasonal variations." It does not direct the water management districts to define seasonal variability criteria or restoration targets. Seasonal variation in flow patterns and the amount of water needed for restoration are important components for overall river management. However, there are better tools available to accomplish these tasks.

A review of the MFL methods used by other water management districts, as well as the method that was applied to the Wekiva River, clearly shows that these approaches would not be appropriately applied to the Loxahatchee River. The Wekiva River is not connected to the ocean (is not threatened by salt water intrusion or sea level rise), is a highly altered system, and has floodplain communities that differ significantly from communities in the Loxahatchee River.

The Wekiva River system also has the advantage that 50 years of flow records were available for the spring. The primary issue addressed in the Loxahatchee River is the significant harm caused by intrusion of salt water within the upper reaches of the river during the dry season. No basis for significant harm due to withdrawals was determined to exist due to seasonal hydropattern conditions within the floodplain swamp. Analyses based floodplain transects indicate that these different management goals can be in conflict at higher flows, but at the proposed MFL flow of 35 cfs, both floodplain management and saltwater intrusion goals can be reasonably balanced. Furthermore, peer reviewers of the Wekiva River document indicated concern that the multiple MFL regime was not based on biological (resource) criteria, but rather upon historical water level (hydrologic) data. Development of comprehensive restoration and management targets for the Loxahatchee, which encompass low, average, and high flow conditions, are currently being carried out by a multi-agency team that includes the FDEP and SFWMD. These rainfall-based, seasonally varying delivery patterns, which reflect natural flow conditions in the system, will be the basis for water reservations -- the primary tool of the SFWMD associated with restoration.

LOX RIVER COALITION COMMENT:

IX. As currently written the MFL Criteria would harm the Loxahatchee River

As currently written, the MFL Criteria would allow the minimum flow to be evaded substantially over-time and throughout the year, which would harm the River.

The wording of the minimum flow criteria needs to be corrected. As it could be misinterpreted to suggest that, during dry periods, the minimum flow over Lainhart Dam could be allowed to fall below the minimum for 20 days at a time, repeatedly, so long that it is brought back up to 35cfs every 21st day. Under such an interpretation, the policy would allow the minimum to be met as few as 17 isolated days throughout a year (4.72% of the time). We doubt that, under the current modeling, this would be sufficient to prevent further harm.

We suggest that the criteria include a policy wherein low flows trigger water restrictions, as per Henry Dean's outstanding work on the Wekiva River MFL regime, or a limit on how many days the flow may fall below the minimum throughout a single year.

DISTRICT STAFF'S RESPONSE:

District staff have revised the proposed MFL rule language to address this concern. A MFL exceedance occurs within the Northwest Fork of the Loxahatchee River when flows over Lainhart Dam decline below 35 cfs for more than 20 consecutive days more than once in a six year period, or when the average daily salinity concentration expressed as a 20-day rolling average exceeds two parts per thousand more than once in a six year period. The average daily salinity will be representative of mid-depth in the water column (average of salinities measured at 0.5 meters below the surface and 0.5 meters above the bottom) at river mile 9.2 (latitude 26.9839, longitude 80.1609). If the drought event is greater than 1-in-10, Phase 3 restrictions will be imposed.

LOX RIVER COALITION COMMENT:

X. There is no evidence to support the 50% reduction of the Minimum Flow from 70 cfs to 35 cfs.

There has not been shown significant credible scientific evidence in the July 2002 draft to support the reduction of the staff's recommended minimum flow over Lainhart Dam from 70cfs, in its May 2001 draft, to 35cfs. The modeling has not significantly changed between the two drafts to support such a drastic reduction.

In 2001, District staff recommended a minimum flow of 70cfs over Lainhart Dam in order to preserve the remaining freshwater habitat up to river mile 8.1 on the basis that as recently as 1970 a healthy bald cypress ecosystem resided in this area. It was the staff's intention, at that time, to keep the saltwater wedge near river mile 8.1. This year, staff has decided to reduce that recommended minimum by half, nearly to a level of flow that staff previously believed would be disastrous to the freshwater cypress forest:

"A continuous discharge from Lainhart Dam within the 30 cfs range would allow saltwater to penetrate as far as 9.0 miles upstream which is within the remaining "healthy" cypress zone. Allowing saltwater to penetrate this far upstream would set up the opportunity for saltwater contamination of the floodplain groundwater system that could potentially result in the stress or mortality to the remaining bald cypress community. Such an event would be considered significant harm to the water resources or ecology of the area."

30cfs is not much less than 35. Under the flow criteria proposed in the 2002 draft, wherein flows over Lainhart may be allowed to fall below 35cfs for up to 20 days at a time, it is reasonable to assume that the saltwater wedge will continue its encroachment upon the freshwater habitat. We have not found convincing hydrological support in the current document to justify such a marked change in recommended minimum flow.

The District acknowledges that a significant part of the National Wild & Scenic portion of the NW Fork was already seriously harmed by 1985. In our opinion, it was the responsibility of the District, as custodians of the River, to initiate restoration of the River at the time of its Wild & Scenic designation. All of the parties adopting the Loxahatchee Wild and Scenic River Management Plan are charge with preserving and enhancing the River to the fullest extent of its authority. To the extent that the District maintains the River in a damaged condition, neither preserved nor enhanced, it has failed to fulfill its agreement with the other agencies and the People of the State of Florida.

DISTRICT STAFF'S RESPONSE:

It is the intent of the South Florida Water Management District to ensure that all planning documents produced by staff are based on sound scientific principles and information. As part of the process of developing MFL technical criteria for the Loxahatchee River, the District assembled an independent panel of experts to conduct a scientific peer review of the 2001 draft document, which proposed 70 cfs as a MFL for the NW Fork. Response from the peer review panel clearly indicated that this flow target was developed as a result of a policy decision of

where significant harm occurred, rather than from a scientific determination. The panel felt that establishing a specific salinity value for protection of the bald cypress community could not be supported by the technical information presented in the document (see page 5 from the final peer review panel report). Hence, additional field studies were conducted on the resource of concern (the freshwater floodplain swamp) and the locations of "healthy," "stressed," and "significantly harmed" freshwater swamp were defined and the flow required to protect the resource from significant harm was calculated.

In the first draft document, much emphasis was placed on bald cypress as the key indicator species. Our more recent field studies, as well as those of authors working in cypress forests in Louisiana and elsewhere, indicate that bald cypress can be somewhat salt tolerant. In fact, bald cypress is still found along portions of the River where other species (e.g. pop ash, dahoon holly, water hickory, and Virginia willow) have been lost due to salinity exposure. Because of this, bald cypress is not an appropriate indicator of floodplain "health" or the location of the remaining freshwater floodplain swamp.

The basis for establishing the MFL at a location in the floodplain swamp along the NW Fork, as it was described in 1985, was discussed previously in the response concerning comparison of 1984, 1985 and current aerial photos and FDEP vegetation maps.

In addition to this MFL, which is intended to achieve partial enhancement of the Northwest Fork of the Loxahatchee River to prevent significant harm, restoration of the Loxahatchee River beyond the MFL will be addressed pursuant to Rule 40E-8.421(6), F.A.C. and other applicable provisions of state law. The South Florida Water Management District commits to restore freshwater flows to the Northwest Fork of the River above the MFL through Chapter 373, F.S. and the Comprehensive Everglades Restoration Plan, Northern Palm Beach Project Implementation Report (NPB-PIR), and its associated authorities. The District will continue to partner with the FDEP to establish an achievable restoration goal and plan for the Loxahatchee River watershed that will be implemented through the NPB-PIR process. This MFL will be reviewed within two years of adoption and revised, if necessary, to ensure consistency with the restoration goal and plan identified pursuant to Rule 40E-8.421,F.A.C. or other applicable provisions of state law.